ANTENNA INTERLOCK FOR HOUSING ASSEMBLY

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to improvements in housings for portable electronic devices, and particularly to advantageous aspects of an antenna interlocking arrangement for use in portable telephones.

2. Description of the Prior Art

The housing for small electronic devices, e.g., portable telephones, typically includes upper and lower housings that fit together in a predetermined configuration. During the manufacturing process, an electronic sub-assembly is placed between the upper and lower housings, which are then fitted together around the sub-assembly and then attached to each other using various means known in the art, including screw fasteners and zipper assemblies. Where a screw fastener is used, the screw typically passes through a hole in the exterior wall of one of the housings and is received by a threaded post on the interior wall of the opposite housing.

These prior art structures have a number of known disadvantages. First, the use of screws or other fastening means typically require additional parts, which adds to the manufacturing costs. Further, these prior art structures require the use of a tool, such as a screwdriver, to assemble the apparatus in the manufacturing process, and then to disassemble and reassemble the portable telephone in the field for maintenance or repair. In addition, screws or other prior-art fastening means can in themselves be a source of mechanical failure. For example, the screw threads may become stripped, or the screw post may fracture. This is particularly a problem in portable telephones, as they are used in a wide range of environments and are subject to various stresses and shocks.

There is thus a need for a housing fastening system that does not require the use of additional parts or assembly equipment and which is resistant to damage.

SUMMARY OF THE INVENTION

The present invention overcomes these and other disadvantages of the prior art by providing an antenna interlock system comprising an upper housing and a lower housing, each having interlock tabs disposed along its interior wall, the interlock tabs each having an aperture shaped to closely receive the antenna unit. The interlock tabs are disposed relative to each other such that when the upper and lower housings are assembled together, the interlock tabs together define a pathway for receiving the antenna unit, and such that when the antenna unit is inserted into the receiving apertures, the antenna unit and the interlock tabs hold the upper and lower housing together.

Additional features and advantages of the present invention will become apparent by reference to the following detailed description and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a front view of a portable telephone incorporating an antenna interlock system according to the present invention.

FIG. **2** shows a cross section diagram through plane **2**—**2** of the portable telephone shown in FIG. **1**

FIGS. **3**A–C show, respectively, interior, left side, and exterior views of an upper housing according to the present invention.

FIG. **3**D shows a cross section of the upper housing through plane D—D shown in FIG. **3**C.

FIG. **3**E shows a top view of an upper housing according to the present invention.

FIGS. **4**A and **4**B show, respectively, an exterior view and an interior perspective view of a lower housing for use with the upper housing shown in FIGS. **3**A–E.

FIG. **5** shows an exploded perspective view of a portable telephone incorporating the upper and lower housings shown in FIGS. **3**A–E and FIGS. **4**A and **4**B.

DETAILED DESCRIPTION

FIG. **1** shows a simplified plan view of a portable telephone unit **10** according to the present invention. As shown in FIG. **1**, the telephone **10** has a substantially rectangular profile. The telephone **10** includes an antenna unit that extends down the length of the interior of the portable telephone, proximate to the left side, and protrudes from the top of the telephone. The antenna unit includes an antenna housing **12***a* and a telescoping antenna element **12***b,* which is slidably mounted inside the antenna housing **12***a.* When the telephone **10** is in use, the antenna element **12***b* is slid out of the antenna housing **12***a* to a fully extended position, while the antenna housing **12***a* remains in a fixed position relative to the body of the portable telephone **10**. The telescoping antenna element **12***b* is mounted inside the antenna housing **12***a* in such a way to prevent the telescoping element **12***b* from being pulled entirely out of the antenna housing **12***a.* It will be appreciated in light of the following discussion that the present invention can also be practiced with a non-extendible antenna of fixed length.

FIG. **2** shows a cross section diagram of the major components of a portable telephone unit **10** incorporating an antenna interlock system according to the present invention. In the present invention, the antenna unit itself holds the upper housing **14** and lower housing **16** together. This eliminates the need for screws or other fastening means. As described above, these prior art structures have known disadvantages.

As shown in FIG. **2**, the upper housing **14** includes first and second interlock tabs **18***a,* **18***b* disposed along its interior wall, proximate to the ends thereof. Corresponding third and fourth antenna interlock tabs **20***a,* **20***b* are disposed along the interior wall of the lower housing **16**. The interlock tabs **18***a,* **18***b,* **20***a,* **20***b* are of sufficient length to extend across the path of the antenna housing **12***a.* In addition, the interlock tabs **18***a,* **18***b* on the upper housing **14** lie immediately between the interlock tabs **20***a,* **20***b* on the lower housing **16**, such that the interlock tabs on the upper and lower housings abut each other. It will be seen that this arrangement serves to hold the upper and lower housings **14**, **16** in position relative to each other along the longitudinal axis of the antenna unit **12***a,* **12***b.*

The interlock tabs **18***a,* **18***b,* **20***a,* **20***b* are preferably molded integrally with the upper and lower housings **14**, **16**. The use of an integral molding technique has the advantage of ease of manufacture and strength. However, it would be possible, if desired, to use interlock tabs that are manufactured separately from the housings, and then subsequently attached to the housings.

Each interlock tab **18***a,* **18***b,* **20***a,* **20***b* includes an aperture that is of a shape and size to closely receive the antenna housing **12***a.* The receiving apertures are shown in FIGS. **3** and **4**, and discussed further below. When the upper and lower housings **14**, **16** are assembled together, the apertures line up with each other, thereby defining a pathway for insertion of the antenna unit **12***a,* **12***b.*